

Reference haplotypes

| | | | | | | |
|-------|---|---|---|---|---|---|
| h_1 | 1 | 1 | 0 | 0 | 1 | 0 |
| h_2 | 1 | 1 | 0 | 0 | 1 | 0 |
| h_3 | 1 | 1 | 0 | 0 | 1 | 0 |
| h_4 | 1 | 0 | 1 | 0 | 0 | 1 |
| h_5 | 1 | 0 | 1 | 0 | 0 | 1 |
| h_6 | 1 | 0 | 1 | 0 | 0 | 1 |
| h_7 | 0 | 0 | 0 | 0 | 0 | 1 |
| h_8 | 0 | 0 | 0 | 0 | 0 | 1 |

Target genotype

| | | | | | | |
|-------|---|---|---|---|---|---|
| x_1 | 2 | 1 | ? | 0 | ? | 1 |
|-------|---|---|---|---|---|---|

1. Find unique haplotypes

2. Initialize missings

Unique reference haplotypes

| | | | | | | |
|-------|---|---|---|---|---|---|
| h_1 | 1 | 1 | 0 | 0 | 1 | 0 |
| h_4 | 1 | 0 | 1 | 0 | 0 | 1 |
| h_7 | 0 | 0 | 0 | 0 | 0 | 1 |

$$\|x'_1 - h_1 - h_4\|^2 = 2$$

$$\|x'_1 - h_1 - h_7\|^2 = 2$$

$$\|x'_1 - h_4 - h_7\|^2 = 3$$

3. Find (possibly many) haplotype pairs using BLAS3 with least squares objective

$$x'_1 \approx h_1 + h_4$$

$$x'_1 \approx h_1 + h_7$$

4. R-calculating error on x_1 instead of x'_1

$$\|x_1 - h_1 - h_4\|^2 = 0$$

$$\|x_1 - h_1 - h_7\|^2 = 1$$

x_1 's optimal hap-pair(s)
 $= (h_1, h_4)$

5. Find all matching haplotypes in original reference panel

$$h_1 = h_2 = h_3$$

$$h_4 = h_5 = h_6$$

6. Form all possible haplotype pairs

$(h_1, h_4), (h_1, h_4), (h_1, h_6)$

$(h_2, h_4), (h_2, h_4), (h_2, h_6)$

$(h_3, h_4), (h_3, h_4), (h_3, h_6)$